USA Report to AST-16, March 2015. (Submitted by D. Roemmich)

Organization of U.S. Argo:

The U.S. Argo Program is supported with major funding provided by the National Oceanic and Atmospheric Administration (NOAA), and additional participation of the U.S. Navy. It is implemented by a U.S. Float Consortium that includes principal investigators from six institutions: Scripps Institution of Oceanography (SIO), Woods Hole Oceanographic Institution (WHOI), the University of Washington (UW), the Atlantic Oceanographic and Meteorological Laboratory (AOML), the Pacific Marine Environmental Laboratory (PMEL), and the Naval Research Laboratory (NRL/Monterey). Float technology development, production, deployment, array monitoring, and data system functions are distributed among these institutions on a collaborative basis.

In addition to U.S. Argo floats, Argo-equivalent floats have been provided from a number of U.S. float groups, programs, and principal investigators. A notable new U.S. Argo-equivalent program is Southern Ocean Carbon and Climate Observations and Modeling (SOCCOM). SOCCOM, with support from the National Science Foundation and in partnership with U.S. Argo, will deploy about 200 floats equipped with biogeochemical sensors in the Southern Ocean in the coming 5 years. The contributions of all Argo-equivalent partners are gratefully acknowledged.

The present 4-year cycle of U.S. Argo implementation began in July 2011, and extends through June 2015. A new 5-year Work Plan for the period July 2015 – June 2020 has been submitted and favorably reviewed.

Objectives:

During the next 5-year cycle, U.S. Argo will sustain the present contribution of over half of the Argo array while enhancing coverage on a regional basis (high latitudes, western boundary and equatorial regions, marginal seas) as recommended through ocean observing system community activities and endorsed by the AST. These coverage enhancements will only be implemented if sufficient resources are available to maintain the coverage and quality of the original Argo array. Further improvements in data quality, timeliness, and resolution are planned, along with ongoing extensions to float lifetimes and cost-effectiveness.

A major enhancement to Argo is the implementation of Deep Argo to extend sampling to the ocean bottom (up to 6000 m). As a key component of the Deep Ocean Observing Strategy (DOOS), Deep Argo is needed to close regional and global budgets of heat, freshwater, and steric sea level, and for exploration of deep ocean circulation. Following two further years (2015 – 2017) of pilot deployments in regional arrays to test floats and sensors and to aid in global array design, U.S. Argo proposes to produce and deploy approximately 100 Deep Argo floats annually, to be integrated with planned contributions of international partners.

Support level:

The support level for U.S. Argo in the coming 5-year cycle is not yet confirmed. Support levels have remained approximately flat since 2004, when 396 U.S. Argo program (i.e. not including Argo equivalent) floats were deployed. Inflationary erosion has lowered the number of yearly deployments, to an average of 346 floats per year for 2012–2014 U.S. Argo deployments. However, due to increases in the mean lifetime of floats, and with contributions from Argo-equivalent programs, the number of active U.S.floats has increased by about 15% since late 2010.

Support for U.S. Argo includes float production and deployment, technology improvement, communications, data system development and implementation for real-time and delayed-mode data streams, and participation in international Argo coordination, Regional Centers, and outreach activities.

Beginning in 2011, U.S. Argo began development and testing of Deep Argo floats. These instruments will profile to pressures as great as 6000 dbar, and be capable of more than 100 cycles. Deployment of prototype floats has begun, including 2 Deep SOLO instruments that were deployed in June 2014 by RV Tangaroa. These floats have completed about 65 profiles each, to depths of about 5700 m. A multi-national (N.Z., Australia, U.S.) Deep Argo deployment cruise is planned for August 2015, including 10–12 Deep Argo floats in a regional pilot array in the SW Pacific Basin. U.S. Argo will also be a sponsor of the Deep Argo Implementation Workshop in May 2015.

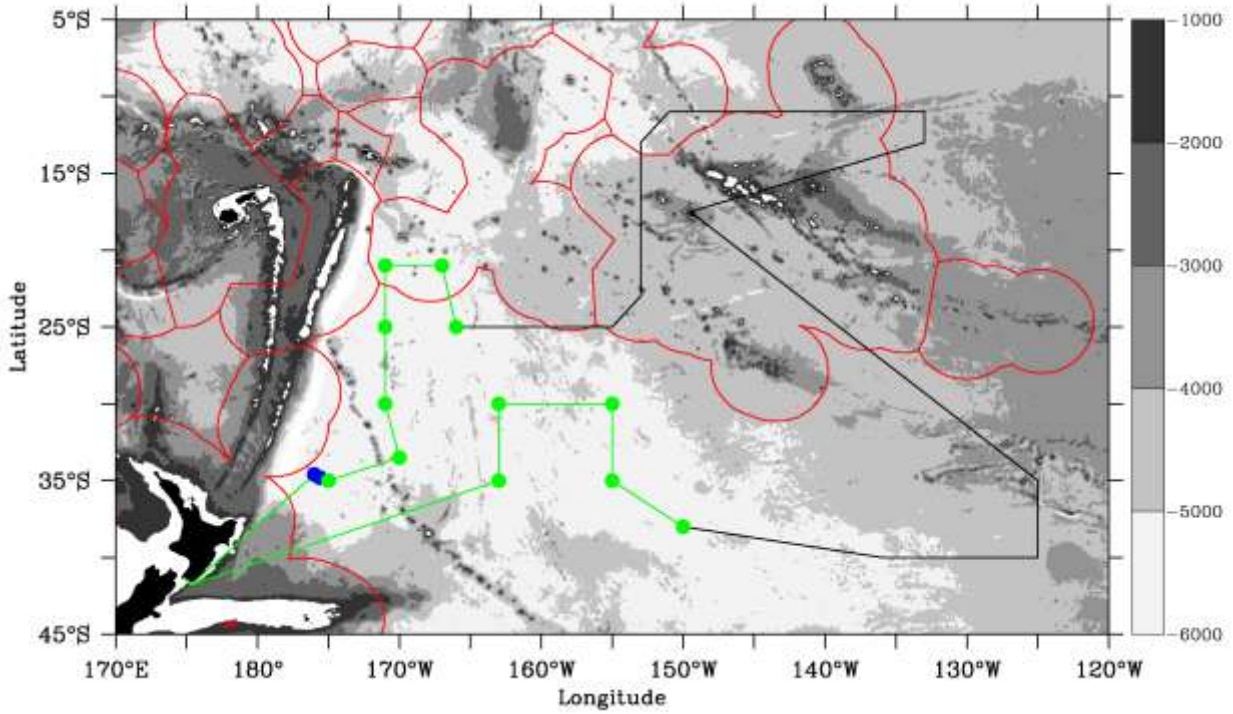

Fig 1 RV Kaharoa cruise plan, August 2015, for deployment of 10–12 Deep Argo floats (green dots, all > 5000 m depth) and recovery of 2 others (blue dots) in the SW Pacific Basin.

Status:

As of March, 2015, there are 2118 active U.S. Floats (source AIC) and these have completed an average of 129 cycles. Of the active floats (Fig 2), 1900 are provided by U.S. Argo and 218 by partnering Argo-equivalent programs.

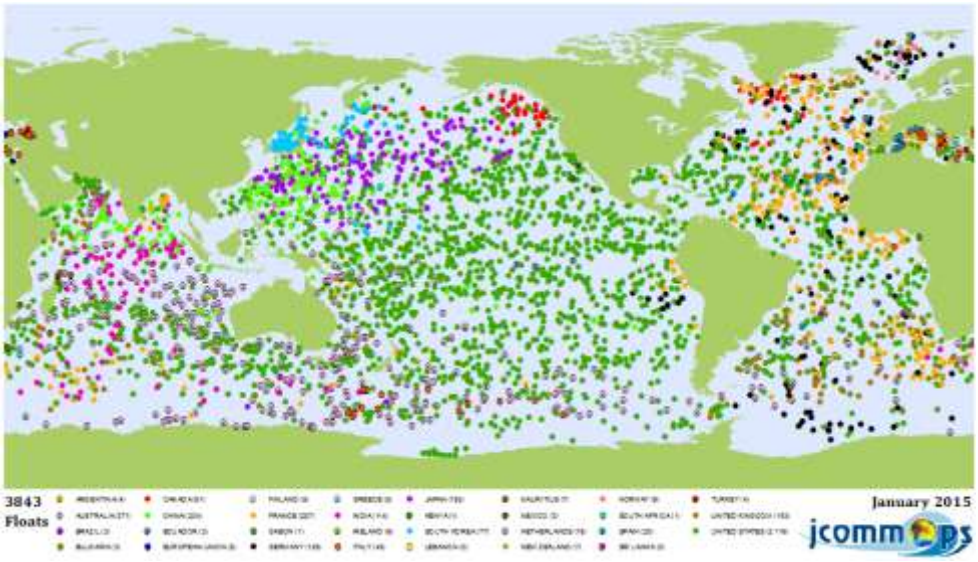

Fig 2 Positions of 2116 active U.S. floats (green dots) as of January 2015.

The highest priority for U.S. Argo is to sustain the core global Argo array. Specific plans for float deployments in 2015, as they evolve, are posted on the AIC deployment planning links. A major U.S./New Zealand/Australia deployment cruise from New Zealand to Mauritius and back was carried out in late 2014 on R/V Kaharoa, adding 121 floats, mostly in the South Indian Ocean.

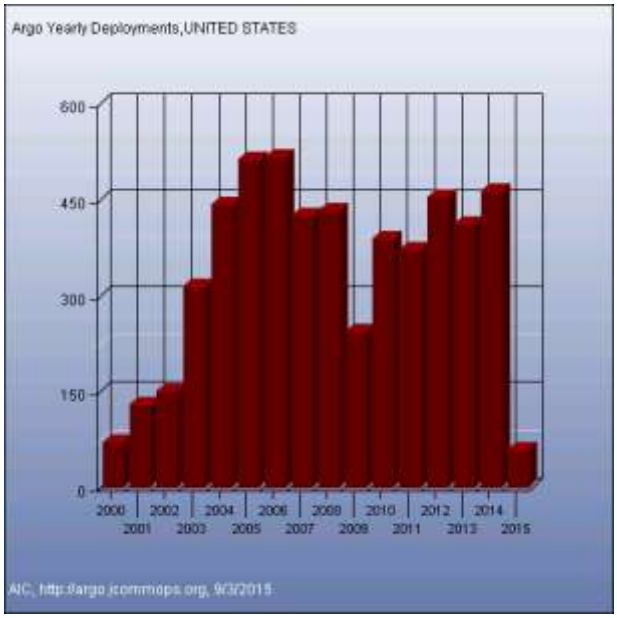

Fig 3. Yearly deployment of U.S. floats, including Argo-equivalent. (Source: AIC)

The U.S. Argo Data Assembly Center is based at NOAA/AOML. Real-time data from all U.S. Argo floats are transmitted via the GTS. GTS transmission uses parallel systems developed at AOML and housed at AOML and at Collect Localisation Satellites (CLS), implementing internationally-agreed quality control tests. The AOML data center serves as the national focus for data management and is the conduit for delayed-mode data to pass between the PIs and the GDACs. During 2014, processing of delayed-mode files continued but was slowed somewhat by adoption of new file formats.

In addition to the national DAC, a Global Data Assembly Center (GDAC) is run as part of the GODAE server, located at the Naval Research Laboratory, Monterey. The two GDACs at NRL/Monterey and IFREMER/Brest are mirror images in their assemblies of Argo data from all international partners, and are responsible for dissemination of the data. Several U.S. institutions participate in Argo Regional Center activities, including AOML's role as focus for the South Atlantic ARC.